

*USING INTERMITTENT REINFORCEMENT TO PROGRAM MAINTENANCE  
OF VERBAL/NONVERBAL CORRESPONDENCE*

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We investigated the effects of an intermittent reinforcement procedure on maintenance of verbal/nonverbal correspondence with nutritious snack choices in a day-care setting. Nutritious snack choices were first established using correspondence training procedures in a multiple baseline across three children. Withdrawal of the procedures with one subject led to loss of appropriate responding, suggesting the need for a maintenance strategy. The intermittent reinforcement procedure was implemented in a multiple baseline across subjects. Nutritious snack choices were observed consistently during the intermittent reinforcement condition and the subsequent extinction condition.

DESCRIPTORS: correspondence training, intermittent reinforcement, nutrition, preschool children

Research on correspondence between verbal and nonverbal behavior has begun to explore maintenance of correspondence (Baer, Williams, Osnes, & Stokes, 1984; Guevremont, Osnes, & Stokes, 1986; Whitman, Scibak, Butler, Richter, & Johnson, 1982). Maintenance of correspondence is seen when, after training correspondence with a particular target response, the subject continues to keep promises to engage in that response. Maintenance of correspondence is important because it could allow a behavior change agent to control a response by prompting a verbalization about that response, and to maintain this control over time (Israel, 1978).

Baer et al. (1984) and Whitman et al. (1982) demonstrated a successful method of programming maintenance of correspondence, using delayed re-

inforcement. In these studies, maintenance of correspondence was obtained by making reinforcement contingent on emitting the appropriate verbalization, but delaying delivery of reinforcement until after the opportunity to correspond had occurred. This procedure required the daily delivery of consequences throughout the maintenance condition. Thus, maintenance under extinction conditions was never measured.

Karlan and Rusch (1982) suggested that intermittent application of the correspondence training contingencies might successfully program maintenance of correspondence. Because previous research has suggested that gradual thinning of the schedule of consequence delivery is effective in promoting maintenance (e.g., Kazdin & Polster, 1973), we examined programming maintenance of correspondence with an intermittent consequences condition in which consequences for correspondence were gradually presented less frequently over time and eventually eliminated.

To date, few applications of correspondence

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training procedures to health-related behaviors have been documented. Therefore, this study targeted nutritious snack choice in young children. Correspondence training is a potentially cost-effective method of bringing nutritious snacking behavior under control. Previous studies have shown difficulty in achieving maintenance of nutritious snack choices (e.g., Epstein, Masek, & Marshall, 1978; Stark, Collins, Osnes, & Stokes, 1986).

## METHOD

### *Subjects and Setting*

Three children enrolled in a day-care center served as subjects. They ranged in age from 4.5 to 5.5 years. All were developmentally normal and exhibited no major behavior problems. They had been nominated by the day-care center staff as likely to choose sweet or salty snacks.

Sessions were conducted at 3:00 p.m. daily, in a playroom measuring 6.5 m by 3.3 m. Subjects sat at a table measuring 1 m by 0.5 m. An additional table was set near the door with the day's snack choices arranged on it. A nearby kitchen was used for teaching verbalizations and delivering consequences.

### *Target Behavior and Measurement*

Each day at snack time, the children were offered a choice of four snack foods. Two were nutritious (fruit or vegetable) and two relatively nonnutritious (cookie or cracker). Each food was cut into chunks approximately one quarter the serving size usually given at the facility. From these four foods, children were allowed to choose any combination of three or four chunks for their snack. Choices were recorded by an observer. Data were expressed as the percentage of each child's chosen snack that was nutritious.

The snack foods were selected from a list of snacks frequently served at the day-care center. These included apple, orange, banana, carrot, green pepper, cookies, crackers, and pretzel. A weekly schedule of menus then was developed in which each food appeared twice.

### *Interobserver Agreement*

A second observer independently recorded snack choices during 25% of the snack sessions, distributed evenly across experimental conditions. An agreement was counted when both observers recorded that a child chose a particular snack food. Percentage of agreement was defined as the number of agreements divided by the total number of agreements and disagreements. Percentage of agreement averaged 98% (range, 85% to 100%).

### *Procedures*

Every day at 3:00 p.m., an experimenter took each child individually into the kitchen, showed him or her photographs of the four snack foods available that day, and asked what the child would choose. On the first day, the experimenter explained that the child could have four chunks in any combination. Each child was required to state whether he or she would choose healthy foods. Prompts were provided if necessary. Consequences for verbalizations varied across experimental conditions. After verbalizing, each child went to the snack room, selected four chunks of snack food from the serving table, and then sat down at the snack table. This buffet style allowed each child to select snack foods before observing what the other children had selected, thereby minimizing any modeling effect that could have confounded the results.

A research assistant (or two) recorded the children's snack choices, initiated conversation, praised desirable behavior such as sitting appropriately, and ensured that the children took the allowed amount of snack food. The snack leader never talked about the children's snack choices or about nutrition.

Consequences for snack choices were provided immediately following snack time. Consequences were items from a grab bag containing squares of cardboard with various consequences written on them, such as hugs, tickles, swings, lifts, or stickers. The delivery of consequences varied across conditions.

### *Experimental Conditions*

**Baseline.** Just before snack time, each child was taken individually to the kitchen, allowed to draw

from the grab bag, and awarded the specified consequence. Next, the child was shown photographs of that day's four snack foods and asked, "What are you going to choose for your snack today?" After the child stated what he or she would choose, the experimenter said, "OK." The child then went to the snack room. No consequences for actual snack choice were delivered during baseline.

*Reinforcement of verbalization.* The child was told that he or she must promise to choose "mostly healthy foods" in order to draw from the grab bag. The child was not required to state exactly which foods he or she would choose. Each child was also required to identify which of the four foods were the healthy ones. If the child did not know, the experimenter told the child and asked the child to repeat it. This was a rare occurrence. After promising to choose healthy foods and indicating which of the four choices were healthy, the child drew from the grab bag, was awarded the consequence, and went to the snack room. No consequences for snack choice were delivered during this condition.

*Reinforcement of correspondence.* Just before snack time, each child was shown the photographs of food and asked what type of food he or she would choose. On the first 2 or 3 days, each child was told that the grab bag would be available after snack time if he or she chose "mostly healthy food" for snack, and that "mostly" meant at least three healthy chunks. This criterion was chosen because it was an improvement over baseline levels, yet did not require the children to forego sweet or salty snacks entirely.

After the snack period, consequences were delivered to each child individually. If the child had met the criterion for reinforcement, he or she was allowed to draw from the grab bag. Otherwise, the child was told, "You said you would choose mostly healthy food for snack today, but you didn't. That means you can't draw from the bag today."

*Intermittent consequences for correspondence.* After the child stated what he or she would choose, he or she went to the snack room. Consequence delivery occurred as in the reinforcement of correspondence condition, but less frequently. Initially, consequences were delivered on 67% of days. When

snack choice behavior had met criterion for reinforcement for 5 consecutive days, the frequency of delivery of consequences was reduced to 33% of days. This was in effect for 5 to 10 days. The days on which consequences were delivered were randomly determined in advance. When the last 5 consecutive days showed responding at or above criterion for reinforcement, consequences were discontinued entirely. The presnack verbalization still occurred daily.

*Verbalization only.* When snack choice behavior had remained at or above criterion for at least 15 days, consequences were discontinued, but the children continued to verbalize daily that they would choose healthy food. This extinction condition provided a test of maintenance of verbal/nonverbal correspondence.

### Design

The initial experimental conditions were implemented in a multiple baseline across children. After collection of baseline data, Reinforcement of Verbalization was introduced sequentially, with Dan experiencing it several days earlier than Miriam and Barry. When no effect, or a transient effect, was seen, Reinforcement of Correspondence was introduced sequentially, with Miriam experiencing it 3 days earlier than Barry and Dan.

Next, a return to Reinforcement of Verbalization was conducted with Dan, to assess whether healthy snacking would be maintained when positive consequences were no longer contingent on snack choices. Maintenance occurred for only a few days, suggesting that abrupt removal of the reinforcement for healthy snack choices results in little maintenance, and that a maintenance-promoting strategy is necessary. Reinforcement of Correspondence then was reinstated in order to regain appropriate responding.

While the return to Reinforcement of Verbalization occurred with Dan, the maintenance-promoting strategy (Intermittent Consequences for Correspondence) was introduced with Miriam and Barry. This condition led to the Verbalization Only condition, which assessed maintenance of correspondence. Lastly, Intermittent Consequences for

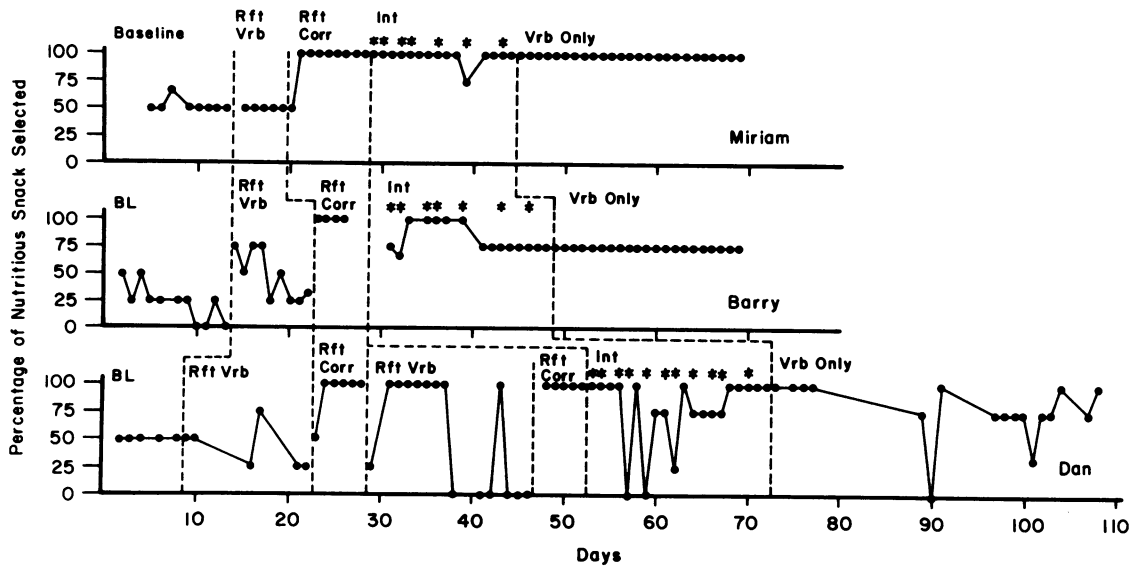


Figure 1. Percentage of nutritious snack selected for all subjects, over days, during baseline (BL), Reinforcement of Verbalization (Rft Vrb), Reinforcement of Correspondence (Rft Corr), Intermittent Consequences for Correspondence (Int), and Verbalization Only (Vrb Only). Asterisks during Int indicate days on which consequences were provided. Missing data points indicate absences.

Correspondence and Verbalization Only were introduced with Dan, to assess further the effects of Intermittent Consequences on response maintenance. In this way, the effects of the Intermittent Consequences procedure were examined in multiple baseline form.

## RESULTS

Data are presented in Figure 1. Verbalization data are not shown because, after baseline, the correct verbalization (to choose healthy foods) always occurred.

During baseline, all children showed moderate to low rates of selecting nutritious food. During the initial Reinforcement of Verbalization condition, Miriam showed no change in responding. Dan showed a very slight effect. Barry showed a transient increase in selection of nutritious food. Reinforcement of Correspondence produced a prompt and consistent increase in the selection of nutritious food to 100% for all children.

A return to Reinforcement of Verbalization was

then conducted with Dan. This resulted in a decrease in nutritious snack choices after a few days, suggesting that abrupt withdrawal of reinforcement results in little maintenance, and that a maintenance-promoting strategy is necessary. Reinforcement of Correspondence was then reintroduced in order to regain criterion levels of responding.

Meanwhile, the Intermittent Consequences condition was introduced with Miriam and Barry. Asterisks indicate days on which consequences were delivered. Responding remained stable at high levels. Intermittent Consequences led to the Verbalization Only condition. For both children, this condition resulted in no change in responding.

Lastly, the Intermittent Consequences condition was implemented with Dan. Initially, snack choice behavior was variable. For this reason, consequence delivery on 67% of days was extended for a period of 15 days. Responding stabilized at or above criterion during the last 5 days of this period. Dan then received consequences on 33% of days for 5 days, during which responding remained above criterion. During the following Verbalization Only

condition, Dan's appropriate snack choice behavior maintained for 17 of 19 experimental days over 7 weeks.

## DISCUSSION

Results of this study showed that correspondence training procedures can be used to promote nutritious snack choices in preschool children. It was also shown that intermittent reinforcement could be used to promote maintenance of correspondence. This procedure allowed an analysis of maintenance in extinction, unlike several previous studies that have used daily delayed reinforcement to promote maintenance.

Although these results suggest that the intermittent consequences procedure was responsible for the observed maintenance, improvements in the design would have strengthened this conclusion. A withdrawal of Reinforcement of Correspondence with all three subjects, prior to implementation of Intermittent Consequences, would have provided more conclusive evidence that a maintenance promotion strategy is necessary to avoid a return to baseline levels of responding. However, previous research, as well as Dan's data in this study, suggests that maintenance often does not occur when reinforcement of correspondence is withdrawn. Thus, this study demonstrates that intermittent reinforcement can effectively promote maintenance, but does not show that such a strategy is always necessary. More careful investigation of the extent to which maintenance promotion strategies are both necessary and sufficient would enhance future research in correspondence training. Examination of the generality of these findings across children would also be worthwhile.

Because the focus of this study was maintenance of verbal/nonverbal correspondence, the impact of these procedures on the children's nutritional status, or on generalization across settings, was not assessed. Nevertheless, the consistency with which snack choices came under control suggests that extension of the procedures to other children with unhealthy eating habits and to other meals and

snacks might result in improvements in health status. Further, these results show longer periods of maintenance than have been seen in most other studies of food choice modification. Development of procedures that promote lasting changes in food choice must precede the development of interventions that influence nutritional status. By demonstrating a method of attaining longer maintenance, this study contributes to the ultimate goal of clinically significant changes in children's eating patterns.

Future research on correspondence training should evaluate whether the effects of reinforcement of correspondence differ from the effects of reinforcement of the target response alone. These results do not demonstrate clearly what functional role the verbalization played in controlling the snack choice behavior. It is possible that the reinforcement provided for nutritious snack choices was partially or even solely responsible for the observed changes in this response. This question was not the focus of the present study, nor has it been addressed in the correspondence training literature as a whole. Future research should address it by including a condition in which children do not promise to engage in the target response, but can receive reinforcement for doing so. The advantages, disadvantages, and complexities involved in doing so have been discussed by Matthews, Shimoff, and Catania (1987) and Stokes, Osnes, and Guevremont (1987).

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